FILE 'HCAPLUS' ENTERED AT 16:46:09 ON 24 AUG 2005

```
                  E  US2003-0626336/PRN,AP
L1          1     S  (US2003-626336/PRN OR US2003-626336/AP)
L2                SEL PLU=ON  L1 1- RN :        6 TERMS
L3     652595     S  L2
L4          1     S  L1 AND L3
                  D  ALL HITSTR
L5                SEL PLU=ON  L4 1- NCL ECLA IC :      3 TERMS
L6      13820     S  OXIDIZING AGENTS/IT
L7        363     S  PEROXIDES, PROCESSES/IT
L8        771     S  VAPOR DEPOSITION PROCESSES(L)PHYSICAL
                  S  ( 7440-21-3/REG# OR SI OR SILICON OR SEMICOND###### OR METHO

       FILE 'REGISTRY' ENTERED AT 16:50:17 ON 24 AUG 2005
L9          1     S  7440-21-3/RN

       FILE 'HCAPLUS' ENTERED AT 16:50:17 ON 24 AUG 2005
L10    419116     S  L9
L11       754     S  L5
L12       754     S  L5
L13       754     S  L5
L14    975146     S  (L10 OR SI OR SILICON OR SEMICOND######
                     OR METHOD OR L13) AND (AQ OR WATER OR H2O OR LIQUID)
                  S  (L10 OR SI OR SILICON OR SEMICOND###### OR METHOD OR L5) AND


       FILE 'REGISTRY' ENTERED AT 17:00:09 ON 24 AUG 2005
L15         1     S  7722-84-1/RN

       FILE 'HCAPLUS' ENTERED AT 17:00:10 ON 24 AUG 2005
L16     88896     S  L15


       FILE 'REGISTRY' ENTERED AT 17:00:10 ON 24 AUG 2005
L17         1     S  10028-15-6/RN

       FILE 'HCAPLUS' ENTERED AT 17:00:10 ON 24 AUG 2005
L18     58224     S  L17
L19       754     S  L5
L20     76649     S  (L10 OR SI OR SILICON OR SEMICOND######
                     OR METHOD OR L19) AND ((L6 OR L7) OR PEROXIDE OR H2O2 OR OZONE
                     OR L18 OR OXIDIZER OR OXIDISER OR L16 )
L21     59438     S  (PRECURSOR OR ORGANOMETAL######### OR
                     METAL#########)(7A)(OXIDIS? OR OXIDIZ? OR OXIDED OR OXIDATE OR
                     OXIDATED OR OXIDATING OR OXIDATION OR OXYGENAT######)
L22    165141     S  (PRECURSOR OR ORGANOMETAL######### OR
                     METAL#########)(7A)(AQ OR WATER OR H2O OR LIQUID)
L23         3     S  L14 AND L18 AND L19
L24      4798     S  L14 AND L18 AND L20
L25        98     S  L14 AND L18 AND L21
L26       209     S  L14 AND L18 AND L22
L27        98     S  L24 AND L25
L28       209     S  L24 AND L26
L29        42     S  L25 AND L26
L30        42     S  L27 AND L28 AND L29
L31        45     S  L23 OR L30
L32        44     S  L31 NOT L4
L33         0     S  DIRECTLY AND L32
L34        19     S  (METAL##### OR ORGANOMETAL? OR PRECURSOR)(5
                     A)(SUBSTRATE OR PLATE OR SLAB OR DIE OR WAFER OR SEMICONDUCT###
                     ##### OR SI OR SILICON) AND L32
                  D  ALL HITSTR TOT
L35        20     S  (LIQUID OR AQUEOUS OR SOLUTION)(4A)(OXID###
                     #### OR OXYGEN######## OR PEROXIDE OR H2O2) AND L32
L36        10     S  L35 NOT L34
L37        13     S  L32 AND (PRECURSOR OR ORGANOMETAL? OR
                     ORGANO METAL##### (2A)METAL######)
L38         2     S  L37 NOT (L35 OR L34)
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FILE 'HCAPLUS' ENTERED AT 17:00:10 ON 24 AUG 2005

```
L39       161    S   OXID#######(5A)DIRECTLY(5A)SUBSTRATE
L40         0    S   L39 AND (L6 OR L7 OR L8)
L41        43    S   L39 AND L3
L42        36    S   L39 AND (L10 OR L11 OR L12 OR L13 OR L14)
L43        14    S   L39 AND (L16 OR (L18 OR L19 OR L20 OR L21
                     OR L22 OR L23 OR L24 OR L25 OR L26 OR L27 OR L28 OR L29 OR L30
                     OR L31 OR L32 OR L33 OR L34 OR L35 OR L36 OR L37))
L44        54    S   (L41 OR L42 OR L43) NOT (L38 OR L35 OR
                     L34)
L45        11    S   L44 AND (LIQUID OR AQUEOUS OR SOLUTION OR
                     WATER OR H2O)
L46         5    S   L44 AND PRECURSOR
L47        13    S   (L45 OR L46)
                 D ALL HITSTR TOT
L48        85    S   (L41 OR L42 OR L43) OR L38 OR L35 OR L34
L49              SEL PLU=ON  L48 1- PRN :      75 TERMS


        FILE 'WPIX, JAPIO, EPFULL, PCTFULL' ENTERED AT 17:12:03 ON 24 AUG 2005
L50       104    S   L49
L51        17    S   L50 AND DIRECTLY
L52         2    S   L50 AND DIRECT(5A)(SUBSTRATE OR WAFER OR
                     PLATE OR SILICON OR SI OR SEMICONDUCT#####)
L53        19    S   (L51 OR L52)
                 D BIB AB KWIC 1-19
L54      1316    S   METAL######(8A) PRECURSOR(8A) SUBSTRATE


        FILE 'HCAPLUS' ENTERED AT 17:17:04 ON 24 AUG 2005
L55              SEL PLU=ON  L4 1- IC :        1 TERM


        FILE 'WPIX, JAPIO, EPFULL, PCTFULL' ENTERED AT 17:17:18 ON 24 AUG 2005
L56       976    S   L55
L57         7    S   L56 AND L54
L58         7    S   L57 NOT L53
                 D BIB AB KWIC 1-7
```

Rush   163706

Date _8/24/05_   Serial # _10/626,336_   Priority Application Date _7/24/03_

Your Name _OBI NADAV_   Examiner # _75025_

AU _2811_   Phone _272 - 1160_   Room _7A39_

In what format would you like your results? Paper is the default.   (PAPER)   DISK   EMAIL

If submitting more than one search, please prioritize in order of need.

The EIC searcher normally will contact you before beginning a prior art search. If you would like to sit with a searcher for an interactive search, please notify one of the searchers.

Where have you searched so far on this case?
Circle: (USPT)   (DWPI)   (EPO) Abs   (JPO) Abs   (IBM TDB)
Other: _____

What relevant art have you found so far? Please attach pertinent citations or
Information Disclosure Statements. _JPO2001123293A_
_____

What types of references would you like? Please checkmark:
(Primary Refs___)   Nonpatent Literature ___   Other _____
Secondary Refs ___   Foreign Patents ___
Teaching Refs ___   _____

What is the topic, such as the **novelty**, motivation, utility, or other specific facets defining the desired **focus** of this search?   Please include the concepts, synonyms, keywords, acronyms, registry numbers, definitions, structures, strategies, and anything else that helps to describe the topic. Please attach a copy of the abstract and pertinent claims.

Metallic precursor directly on semiconductor substrate
and oxidizing the metallic precursor in a liquid, i.e.

metal, oxidizing metal in liquid wherein the metal is
located directly on a semiconductor substrate

                                  Acting SPE : _Steve Loke_

```
     L34   ANSWER 11 OF 19   HCAPLUS   COPYRIGHT   ACS on STN
AN     2001:611680   HCAPLUS
DN     135:188740
ED     Entered STN:  23 Aug 2001
TI     Liquid delivery MOCVD process for deposition of high frequency
       dielectric materials
IN     Stauf, Gregory T.; Roeder, Jeffrey F.; Baum, Thomas H.
PA     Advanced Technology Materials, Inc., USA
       PATENT NO.            KIND   DATE       APPLICATION NO.         DATE
       ---------------       ----   --------   --------------------    --------
PI     US 6277436            B1     20010821   US 1998-216673          19981218
       US 5932905            A      19990803   US 1997-979684          19971126
       WO 2000037712         A1     20000629   WO 1999-US29566         19991213
PRAI   US 1997-979684        A2     19971126
       US 1998-216673        A      19981218
AB     A liq. delivery MOCVD method for deposition of dielec.
       materials such as (Ba,Sr) titanates and (Zr,Sn) titanates, in which metal
       source compds. are dissolved or suspended in solvent and flash vaporized
       at temps. of from .apprx.100.degree. to .apprx.300.degree. and carried via
       a carrier gas such as Ar, N2, He, NH3 or the like, into a CVD reactor in
       which the precursor vapor is mixed with an oxidizing
       co-reactant gas such as O2, ozone, N2O, etc., to deposit the
       high dielec. metal oxide film on the substrate at a
       temp. of from .apprx.400.degree. to .apprx.1200.degree. at a CVD chamber
       pressure of from .apprx.0.1 torr to .apprx.760 torr.  Such process may
       e.g. be employed to form a (Ba,Sr) titanate dielec. material in which
       .gtoreq.60 at of the total metal content of the oxide is Ti.  The high
       dielec. material of the invention may be used to form capacitive
       microelectronic device structures for applications such as dynamic random
       access memories and high frequency capacitors.
IT     Oxides (inorganic), processes
           (liq. delivery MOCVD process for deposition of high frequency
           dielec. materials)
IT     Vapor deposition process
           (metalorg., liq. delivery; liq. delivery
       MOCVD process for deposition of high frequency dielec. materials)
IT     Transition metal complexes
       RL: RCT (Reactant); RACT (Reactant or reagent)
           (polyamine, vapor deposition precursor; liq.
           delivery MOCVD process for deposition of high frequency dielec.
           materials)
IT     7440-21-3, Silicon, processes
       RL: PEP (Physical, engineering or chemical process); TEM (Technical or
       engineered material use); PROC (Process); USES (Uses)
           (liq. delivery MOCVD process for deposition of high frequency
           dielec. materials)
RN     7440-21-3  HCAPLUS
CN     Silicon (7CI, 8CI, 9CI)   (CA INDEX NAME)



  Si




IT     10028-15-6, Ozone, processes
       RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical
       process); PROC (Process); USES (Uses)
           (vapor deposition carrier gas; liq. delivery MOCVD process
           for deposition of high frequency dielec. materials)
RN     10028-15-6  HCAPLUS
CN     Ozone (8CI, 9CI)   (CA INDEX NAME)



  o─o─o
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L47   ANSWER 6 OF 13   HCAPLUS   COPYRIGHT   ACS on STN
AN   2002:776485   HCAPLUS
ED   Entered STN: 11 Oct 2002
TI   **Aqueous** chemical growth of 3-D arrays of metal oxide
       nanomaterials
AU   Vayssieres, Lionel
CS   Department of Physics and Physical Chemistry, Uppsala University, SE-75121
       Uppsala, Swed.
SO   Abstracts of Papers, 224th ACS National Meeting, Boston, MA, United
       States, August 18-22, 2002 (2002), PHYS-146 Publisher: American Chemical
       Society, Washington, D. C.
       CODEN: 69CZPZ
DT   Conference; Meeting Abstract
LA   English
AB   Ordered purpose-built nanomaterials have been obtained by a novel
       synthesis and theor. concept which consists of growing metal **oxide**
       thin films **directly** onto **substrates** at pptn. and
       dispersion conditions yielding to thermodn. colloidal stability (i.e. low
       interfacial tension).   Such specific state is reached by controlling
       exptl. (i.e. chem. and electrostatically) the interfacial tension of the
       system as described quant. by a thermodn. model based on Gibbs adsorption
       equation.   The outcome allows the fabrication of nano- to microparticulate
       thin films of metal oxides with controlled particle size, morphol. and
       nanoparticle orientation onto substrates without template or surfactant.
       Cryst. 1D nanorods of iron oxides (hematite and akaganeite) assembled into
       3D bundles with controlled parallel and perpendicular orientation, 3D
       array of corundum chromium oxide-iron oxide nanocomposite, and highly
       oriented 3D nanorod-array of ZnO have been obtained onto various (single
       and polycryst.) substrates from the condensation of **metal** salts
       in **aq. soln.** at low temp.

L47   ANSWER 3 OF 13   HCAPLUS   COPYRIGHT   ACS on STN
AN   2004:217358   HCAPLUS
DN   140:243895
ED   Entered STN: 18 Mar 2004
TI   Method and apparatus for plasma vapor deposition of metal oxide films or
      metal nitride films
IN   Sakamoto, Hitoshi; Ogura, Ken; Oba, Yoshiyuki; Nishimori, Toshihiko;
      Yahata, Naoki
PA   Mitsubishi Heavy Industries, Ltd., Japan

| PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI JP 2004083945	A2	20040318	JP 2002-243240	20020823
PRAI JP 2002-243240		20020823		

AB   The metal oxide film is formed by a process including steps of (1)
      supplying halogen gas into a chamber and converting it to plasma which
      etches a metal member disposed at a position facing to a substrate so as
      to form a metal halide as a **precursor** of a metal film, (2)
      allowing to deposit a metal film while keeping the substrate temp. lower
      than that of the metal member, and (3) supplying oxygen gas (plasma) to
      oxidize the **metal** film into **metal** oxide film.
      In the process, halogen plasma and oxygen gas/plasma may be simultaneously
      supplied to form a **metal** film (on the **substrate**) is
      subjected to **oxidn.** or to **directly** form a
      metal oxide film. Alternatively, a metal halide is allowed to be
      adsorbed on the substrate in 2, then the halide is **oxidized** with
      oxygen gas plasma to give **metal** oxide film. Also claimed is
      formation of a metal nitride film in the same way, but by using nitrogen
      gas in stead of oxygen gas. The formed metal oxide or nitride film has
      high crystallinity and stable compns.
IT   1314-23-4P, Zirconium oxide, preparation 1314-61-0P,
      Tantalum oxide 12055-23-1P, Hafnium oxide
          (films; plasma vapor deposition of metal oxide or metal nitride film by
          forming **metal** halide and subsequent **oxidn.** or
          nitridation)
RN   1314-23-4 HCAPLUS
CN   Zirconium oxide (ZrO2) (8CI, 9CI)   (CA INDEX NAME)

O═Zr═O
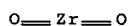
RN   1314-61-0 HCAPLUS
CN   Tantalum oxide (Ta2O5) (8CI, 9CI)   (CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***
RN   12055-23-1 HCAPLUS
CN   Hafnium oxide (HfO2) (8CI, 9CI)   (CA INDEX NAME)

O═Hf═O
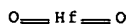
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L58    ANSWER 6 OF 7   WPIX   COPYRIGHT   THE THOMSON CORP on STN
AN     1992-398629 [48]    WPIX
CR     1991-200636 [27]
DNN    N1992-304110        DNC C1992-176815
TI     Forming metal oxide coatings for range of substrate types - by
       coating substrate surface with polymer metal complex
       precursor soln. and firing to achieve specific properties in oxide
       coatings.
DC     A82 L03 M13 P42 P73 U11 U12 X15
IN     CHIEN, J C W; GONG, B
PA     (SCSC-N) ACAD APPLIED SCI; (CHIE-I) CHIEN J C W; (GONG-I) GONG B
CYC    17
PI     WO 9219391      A1 19921112 (199248)* EN   24
           RW: AT BE CH DE DK ES FR GB GR IT LU MC NL SE
           W: CA JP
       US 5318800      A  19940607 (199422)        5
ADT    WO 9219391 A1 WO 1992-US3505 19920428; US 5318800 A CIP of US 1989-407912
       19890915, Cont of US 1991-693431 19910429, US 1992-997118 19921224
FDT    US 5318800 A CIP of US 5024894
PRAI   US 1991-693431        19910429
AB     WO    9219391 A UPAB: 19940727
       Thin, uniform, aberration-resistant and hole-free, high-temp. thermally
       stable metal oxide coatings are formed on a substrate by:- (1)
       forming a polymer-metal-complex precursor soln., (2)
       coating the precursor soln. after filtration uniformly over the
       substrate surface, (3) firing the coated substrate in an air or
       oxygen furnace to oxidise the metal in the coating while burning off all
       traces of the polymer and (4) cooling to provide a hard metal oxide
       coating of submicron or micron range thickness adhered to the substrate
       surface. Pref. the substrate can be either conducting, semiconducting or
       insulating.
           USE/ADVANTAGE - The coating provides one or more of insulation, water
       surfacing, thermal barrier and rust or other oxidn. resistance for a metal
       substrate, or conductivity for an insulating substrate (all claimed). The
       coating method is both less complex and costly than prior art techniques
       such as e.g. sputtering or CVD.
       Dwg.0/0
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L58   ANSWER 2 OF 7 WPIX   COPYRIGHT THE THOMSON CORP on STN
AN   1996-455717 [45]   WPIX
CR   1990-238925 [31]; 1992-316377 [38]; 1993-214414 [26]; 1993-214416 [26];
DNN   N1996-383960   DNC C1996-142978
TI   Prodn. of a layered superlattice material for a ferroelectric device - by
      applying a thin layer of precursor soln. of polyoxyalkylated metals
      including strontium and bismuth and at least one other, to a substrate and
      baking.
DC   L03 U11 U14
IN   ITO, T; MCMILLAN, L D; PAZ DE ARAUJO, C A; SCOTT, M C; YOSHIMORI, H
PA   (OLYU) OLYMPUS CORP; (SYME-N) SYMETRIX CORP; (OLYU) OLYMPUS OPTICAL CO LTD
CYC   20
PI   WO 9630938   A2 19961003 (199645)* EN   77
         RW: AT BE CH DE DK ES FI FR GB GR IE IT LU MC NL PT SE
         W: JP KR
      WO 9630938   A3 19961205 (199712)
      EP 815589   A1 19980107 (199806) EN
         R: AT BE DE FR GB IE IT NL
      JP 11502375   W 19990223 (199918)   83
      KR 98702980   A 19980905 (199938)
      US 6072207   A 20000606 (200033)   <--
      KR 433819   B 20040716 (200474)
PRAI US 1995-405953   19950317; US 1991-660428   19910225;
      US 1991-807439   19911213; US 1992-965190   19921023;
      US 1992-981133   19921124; US 1993-65656   19930521
AB   WO   9630938 A UPAB: 20050512

Wafer having a layered superlattice is formed by applying a liq.
precursor of polyoxyalkylated metals to a
substrate and heating. The metals include Sr and Bi and at least
one of Ta, Nb, Ti and Zr. The precursor optimises an electrical property
in the layered superlattice material.

      USE - As a ferroelectric device with a superlattice layer located
between a pair of electrodes (claimed) for e.g. IC devices.

      ADVANTAGE - The material has extremely low fatigue rates and
polarisabilities as high as 25.

L47   ANSWER 4 OF 13 HCAPLUS   COPYRIGHT   ACS on STN
AN   2003:673084   HCAPLUS
DN   139:371555
ED   Entered STN: 28 Aug 2003
TI   A novel Ge MOS detector for 1.3 .mu.m and 1.5 .mu.m lightwave
        communication
AU   Hsu, B.-C.; Hua, W.-C.; Shie, C.-R.; Lai, C.-C.; Chen, K.-F.; Yuan, F.;
        Liu, C. W.
CS   Department of Electrical Engineering, National Taiwan University, Taipei,
        106, Taiwan
SO   Proceedings - Electrochemical Society (2002), 2002-4(Integrated
        Optoelectronics), 237-252
        CODEN: PESODO; ISSN: 0161-6374

AB   A novel, but simple metal-oxide-**semiconductor** detector using a
        Ge active layer was successfully demonstrated. The **oxide** is
        grown **directly** on Ge **substrate** by **liq.** phase
        deposition with suitable growth conditions. At neg. gate bias, the dark
        current of the photodetector is limited by the thermal generation of
        minority carrier in the inversion layer. The max. external quantum
        efficiency is estd. .apprx.50%. This novel Ge photodetector can be easily
        integrated into **Si** substrate by growing a Ge epi-layer on
        Si substrate.

```
L58   ANSWER 1 OF 7  WPIX  COPYRIGHT  THE THOMSON CORP on STN
AN    2003-505349 [47]   WPIX
CR    1990-238925 [31]; 1992-316377 [38]; 1993-214414 [26]; 1993-214416 [26];
      1994-167303 [20]; 1994-167763 [20]; 1994-167765 [20]; 1994-176138 [21];
DNN   N2003-401292      DNC C2003-135159
TI    Integrated circuit for semiconductor devices has layered superlattice
      material having cerium, praseodymium, neodymium, promethium, samarium,
      europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium,
      ytterbium or lutetium.
DC    L03 P73 U11
IN    MCMILLAN, L D; PAZ DE ARAUJO, C A; SOLAYAPPAN, N; ARAUJO, C A P D
PA    (SYME-N) SYMETRIX CORP
CYC   102
PI    WO 2003049172   A1 20030612 (200347)* EN    53
      US 2003152813   A1 20030814 (200355)
      AU 2002333658   A1 20030617 (200419)
      EP 1449241      A1 20040825 (200456)   EN
      US 2004211998   A1 20041028 (200471)
      KR 2004071692   A  20040812 (200481)           <--
      JP 2005512323   W  20050428 (200530)        37
PRAI  US 2001-998364        20011129; US 1992-965190        19921023;
      US 1992-993380        19921218; US 1995-405885        19950317;
      US 2000-686552        20001011; US 2004-851703        20040520
AB    WO2003049172 A UPAB: 20050512
```

NOVELTY - An integrated circuit comprises a substrate (502), and a thin
film of layered superlattice material formed on the substrate. The thin
film comprises cerium, praseodymium, neodymium, promethium, samarium,
europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium,
ytterbium or lutetium.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(a) fabrication of memory device comprising forming a memory cell on
the substrate including spontaneously forming a layered superlattice
material structure in a thin film; and

(b) fabrication of ferroelectric layered superlattice material,
comprising: providing a substrate; providing a liquid
precursor including metals for forming a layered
superlattice material; applying the precursor liquid to the
substrate; and treating the precursor on the substrate to form a
layered superlattice material containing the metal on the first substrate.

USE - For semiconductor devices, e.g. MOSFET, ferroelectric FET,
heterojunction bipolar transistors, bismuth complementary MOS, infrared
sensitive cells, and capacitors.

ADVANTAGE - The invention has high dielectric constant materials
(524) that do not degrade or break down over long periods of use. It does
not only provide a ferroelectric memory that is more compatible with
conventional integrated circuit elements, but also provide one that is
more manufacturable and more environmentally compatible.

DESCRIPTION OF DRAWING(S) - The figure shows a cross-sectional view
of a dynamic RAM and a ferroelectric RAM memory cell having a FET and a
capacitor.

Memory 500
Substrate 502

  High dielectric constant materials 524

  Inter-level dielectric 536

  Source electrode wiring 538

  Top electrode wiring 539

L47   ANSWER 2 OF 13   HCAPLUS   COPYRIGHT   ACS on STN
AN   2004:348590   HCAPLUS
DN   142:268717
ED   Entered STN: 29 Apr 2004
TI   High efficient 820 nm MOS Ge quantum dot photodetectors for short-reach
      integrated optical receivers with 1300 and 1550 nm sensitivity
AU   Hsu, B.-C.; Chang, S. T.; Shie, C.-R.; Lai, C.-C.; Chen, P. S.; Liu, C. W.
CS   Graduate Institute of Electronics Engineering and Department of Electrical
      Engineering, National Taiwan University, Taipei, Taiwan
SO   Technical Digest - International Electron Devices Meeting (2002) 91-94
      CODEN: TDIMD5; ISSN: 0163-1918
PB   Institute of Electrical and Electronics Engineers
DT   Journal
LA   English
CC   73-11 (Optical, Electron, and Mass Spectroscopy and Other Related
      Properties)
      Section cross-reference(s): 48, 76
AB   A metal-oxide-semiconductor (MOS) Ge quantum dot photodetector
      is demonstrated. The oxide is grown directly on Ge
      substrate by liq. phase deposition (LPD). The
      photodetector has the responsivity of 130, 0.16, and 0.08 mA/W under the
      wavelength of 820 nm, 1300 nm, and 1550 nm, resp. The dark current is
      extremely low (0.06 mA/cm2). The high performance of Ge quantum dot MOS
      photodetectors at 820 nm makes it feasible to integrate optoelectronic
      devices into the Si chip for short-reach optical communication.
IT   7440-21-3, Silicon, uses
      RL: DEV (Device component use); PEP (Physical, engineering or chemical
      process); PYP (Physical process); PROC (Process); USES (Uses)
         (fabrication and characterization of Ge quantum dot optical detectors
         and receivers)
RN   7440-21-3 HCAPLUS
CN   Silicon (7CI, 8CI, 9CI)   (CA INDEX NAME)

      Si

High Efficient 820 nm MOS Ge Quantum Dot Photodetectors for Short-Reach Integrated Optical Receivers with 1300 and 1550 nm Sensitivity

B.-C. Hsu[a], S. T. Chang[a], C.-R. Shie[a], C.-C. Lai[a], P. S. Chen[b], and C. W. Liu[a,b]

[a] Graduate Institute of Electronics Engineering and Department of Electrical Engineering,
National Taiwan University, Taipei, Taiwan, R. O. C.
[b] ERSO/ITRI, Hsinchu, Taiwan, R. O. C.
E-mail: chee@cc.ee.ntu.edu.tw

Abstract

A metal-oxide-semiconductor (MOS) Ge quantum dot photodetector is demonstrated. The oxide is grown directly on Ge substrate by liquid phase deposition (LPD). The photodetector has the responsivity of 130, 0.16, and 0.08 mA/W under the wavelength of 820 nm, 1300 nm, and 1550 nm, respectively. The dark current is extremely low (0.06 mA/cm²). The high performance of Ge quantum dot MOS photodetectors at 820 nm makes it feasible to integrate optoelectronic devices into the Si chip for short-reach optical communication.

Introduction

The interest of silicon-based optoelectronic devices grows rapidly in the last decade (1). However, due to the large absorption length (~16 μm) of Si at 820 nm (2) and the forbidden absorption at 1300 and 1550 nm, the Si-based photodetector has limited detection efficiency and wavelength range. The incorporation of Ge into Si can not only increase the cut-off wavelength, but also enhance the absorption efficiency (small absorption length). The strained Ge could have an absorption length of 0.1 μm or less at the wavelength of 820 nm. In this paper, we use the metal-oxide-semiconductor (MOS) tunneling structure (3) with Ge quantum dot to implement the photodetector at 820 nm with high responsivity and extremely low dark current (<1 mA/cm²). The low temperature (~50 °C) liquid phase deposited (LPD) SiO₂ is used as gate dielectric material to avoid the high temperature thermal oxidation, which induces the Ge-related defects during oxidation. A 5-layer Ge quantum dots with ~2 nm wetting layers is used as a light absorbing layer, together with Si, Ge, and a $Si_{0.8}Ge_{0.2}$ multi-layer structure for comparison.

Strained SiGe/Ge

Fig. 1 shows the bandgap and cut-off wavelength vs strained and relaxed Ge mole fraction. As Ge mole fraction increases, the maximum absorption wavelength also increases. The shadowed area represents the laser bandwidth in our experiment. Fig. 2 shows the absorption length at 820, 1300, and 1550 nm vs Ge mole fraction. The absorption length decreases as the Ge mole fraction increases. For the large Ge fraction, the shadowed areas indicate the uncertainty of the estimation. The incorporation of strained Ge/SiGe into optoelectronic devices makes devices particularly useful over the important fiber optic communications wavelengths, and can be applied to the fiber optic communications.

Ge Quantum Dots Fabrication

The Si/Ge quantum dots are prepared by UHVCVD (ultra high vacuum chemical vapor deposition) on p-type Si (001) substrates. The structure is shown in Fig. 5(a). After Si buffer layer of 50 nm was grown, 5 periods of Ge/Si bilayers were grown to form the self-assembled Ge dots at temperature of 600 °C under the Stranski-Krastanov (SK) growth mode (4). The Ge layers are separated by 50 nm Si spacer layers. A 3 nm (nominal thickness) Si cap was deposited above the top layer of self-assembled Ge layer as the starting layer for the subsequent LPD oxide deposition. All UHVCVD layers are p-type with the estimated concentration on the order of 1×10^{16} cm⁻³. For comparison, RTO (Rapid Thermal Oxidation) was also performed. As a result, the LPD oxide yields larger external quantum efficiency than the rapid thermal oxide (Fig. 3).

Liquid Phase Deposition Oxide

To avoid material degradation such as strain relaxation and Ge out diffusion, the low temperature oxide is often required to reduce the thermal budget of SiGe device process. LPD is a promising low-temperature process for SiO₂ formation with the low thermal budget and low cost. A simplified mechanism of LPD growth was originally proposed by Nagayama et al. (5) based on the reaction of H_2SiF_6 with water to form hydrofluoric acid and solid SiO₂.

$$H_2SiF_6 + 2H_2O \Leftrightarrow SiO_2 + 6HF \tag{1}$$
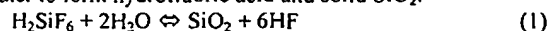
However, the time for solution preparation was too long in this LPD process. Therefore, we used the LPD method with short preparation time (6). The experimental flow diagram for the LPD process is illustrated in Fig. 4. First, the silicic acid ($SiO_2 \cdot xH_2O$) was added to hydrofluosilicic acid (H_2SiF_6, 3 mol/l) at the temperature of 35°C. The solution was then stirred for 3 hrs. Next, the solution was filtered to remove the undissolved silica. H₂O was then added to the saturated

4.3.1

solution. Si, Ge, Ge quantum dot. and $Si_{0.8}Ge_{0.2}$ multi-layer structure were used in this experiment. The native oxide was removed by dipping in diluted HF solution before the LPD process. The substrates were then placed into the immersing solution at 50°C. One interesting observation of LPD oxide on Ge quantum dot samples is that SiO_2 dots are formed directly on Ge dots, as shown in Fig. 5(b) and Fig. 6. The tensile strain field on the Si cap of self-assembled quantum dots can have preferential oxide deposition during LPD process. The oxide dots are formed on the tensile strained area of Si cap, and are aligned vertically with Ge dots embedded in the Si caps.

Photodetector

Fig. 7 shows the typical dark and photo current of a Ge quantum dot detector on p-type substrate. The fiber is pointed to the edge of the gate electrode and the photo-generated carriers can be collected by electrode by lateral drift and diffusion, as shown in the inset of Fig. 7. Note that the photocurrent is relatively independent of applied voltage, and the device can operate close to zero volt bias. Fig. 8 shows the band diagram of a Ge quantum dot NMOS detector under inversion bias. The deep depletion region is formed at inversion bias due to the tunneling of LPD oxide. The photoelectrons are generated in the deep depletion region, and are swept toward the gate electrode. The photoelectrons tunnel from the active layers to the Al gate electrode through the trap-assisted tunneling of LPD oxide. Since the band offset is mainly on the valence band, the electrons in the conduction band is less scattered by the conduction band discontinuity, as compared to holes in the valence band with large valence band discontinuity. The dark current of Si, Ge, Ge quantum dot, and $Si_{0.8}Ge_{0.2}$ multi-layer MOS devices are shown in Fig. 9. Note that the complex structure of valence band due to the wetting layer and quantum dots has little effects on our NMOS, where electron transport dominates. The dark current is mainly determined by thermal generation through the defects in the deep depletion region and the interface states. Thus, the Ge quantum dot device with a smaller bandgap has a larger dark current, as compared to the Si device.

Fig. 10, Fig. 11, and Fig. 12 are the responsivity and efficiency of devices under 820, 1300 and 1550 nm lightwave exposure, respectively. For 820 nm detection, the Ge quantum dot device has a very high external quantum efficiency (20%) similar to the Ge device. With the insertion of Ge quantum dots, the efficiency increases by a factor 10 as compared to the Si device. All the efficiency reported here is the external quantum efficiency. Due to the reflection of Si (~35 % at 820 nm) and the coupling loss, the internal quantum efficiency should reach 30%. This indicates extremely low defect density is formed during the UHV/CVD growth as well as the LPD process, and the defect-related recombination (if any) does not seriously degrade the efficiency. The dark current is as low as 0.06

mA/cm^2 for Ge quantum dot devices, while the dark current of typical Ge pin devices is 20 mA/cm^2 (7). For 1300 nm detection wavelength (Fig. 11), the responsivity of Ge quantum dot devices drops to 0.16 mA/W, due to the insufficient thickness of active layers, while Ge devices still have the responsivity of 100 mA/W. The responsivity of $Si_{0.8}Ge_{0.2}$ multi-layers is only 0.04 mA/W, due to the small Ge fraction in the films. For 1550nm detection (Fig. 12), the responsivity of the Ge quantum dot devices is 0.08 mA/W, while the responsivity of Ge devices is still around 75 mA/W. The quantum dot MOS detectors can also be operated at 850 nm (not shown here) with high responsivity (> 300 mA/W). Note that the LPD oxide quality affects the device performance a lot. Therefore, to have best device performance, both the LPD process and the quantum dot structures should be optimized.

Conclusions

The MOS Ge quantum dot device can detect the wavelength of 820 nm, 1300 nm, and 1550 nm, with the responsivity of 130, 0.16, and 0.08 mA/W, respectively. The bias voltage can be as low as zero volt. The dark current is as low as 0.06 mA/cm^2. The detection efficiency of quantum dot device at 820 nm is close to the Ge device. The high performance of Ge quantum dot MOS detectors with LPD oxide at 820 nm makes it feasible to integrate optoelectronic devices into the Si chip for short-reach optical communication.

Acknowledgments

References

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(4) T. I. Kamins, D. A. A. Ohlberg, R. S. Williams, W. Zhang, and S. Y. Chou, "Positioning of self-assembled, single-crystal, germanium islands by silicon nanoimprinting," *Appl. Phys. Lett.*, vol. 74, pp. 1773-1775, 1999.
(5) H. Nagayama, H. Honda, and H. Kawahara, "A New Process for Silica Coating," *J. Electrochem. Soc.*, vol. 135, p. 2013, 1988.
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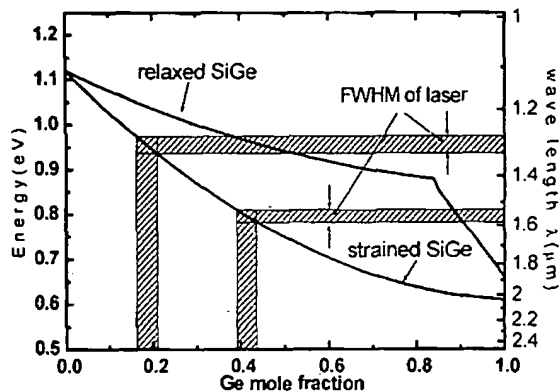
4.3.2

Fig.1 The bandgap and cut-off wavelength vs Ge mole fraction. As Ge mole fraction increases, the maximum absorption wavelength also increases. The shadowed area represents the laser bandwidth in our experiment.
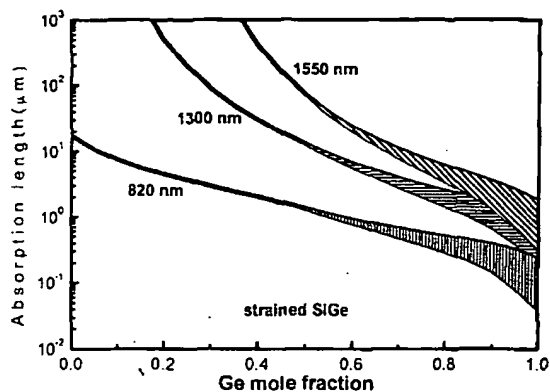

Fig.2 The absorption length at 820, 1300, and 1550 nm vs Ge mole fraction. The absorption length decreases as the Ge mole fraction increases. For the large Ge fraction, the shadowed areas indicate the uncertainty of the estimation.
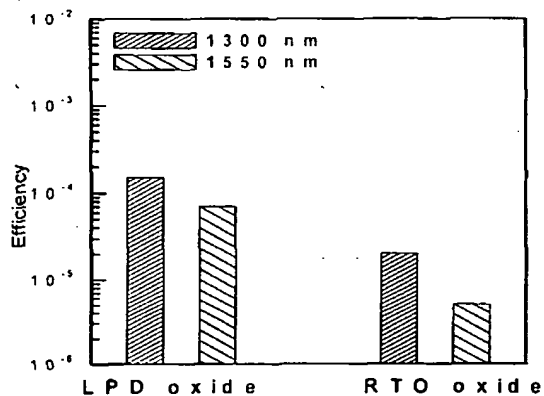
Fig. 3 The characteristics of Ge quantum dot detectors with RTO and LPD oxide. The MOS detector with RTO oxide has low efficiency.

Fig. 4 The process flow of the liquid phase deposition.

Fig. 5 (a) The structure of 5-layer Ge quantum dot devices prepared by UHV/CVD. Note that the top Ge quantum dots have a Si cap of 3 nm. (b) The TEM photograph.
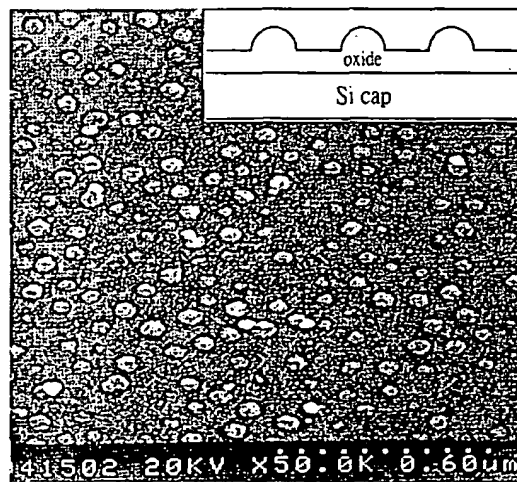
Fig. 6 The SEM morphology of quantum dot samples after the LPD process. The strain induced oxide dots are deposited directly on self-assembled Ge islands.

4.3.3
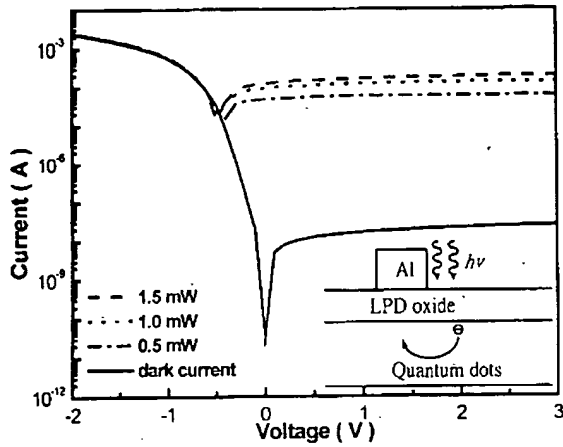
Fig. 7 The I-V characteristics of a quantum dot MOS detector under 820 nm lightwave exposure. The photo-generated carriers can be collected by gate electrode through the lateral drift and diffusion.
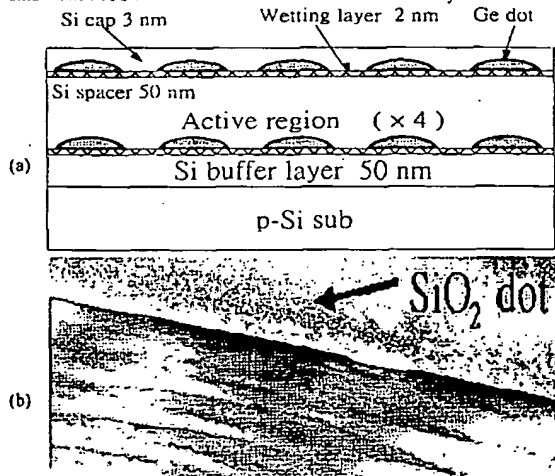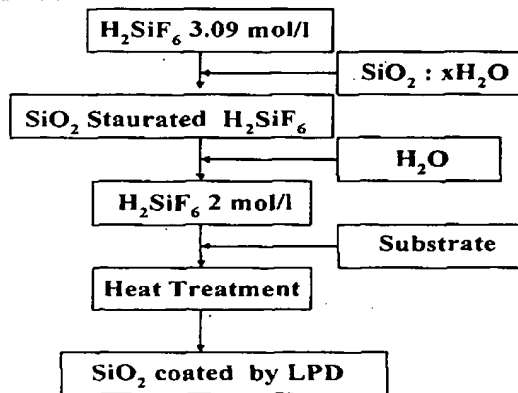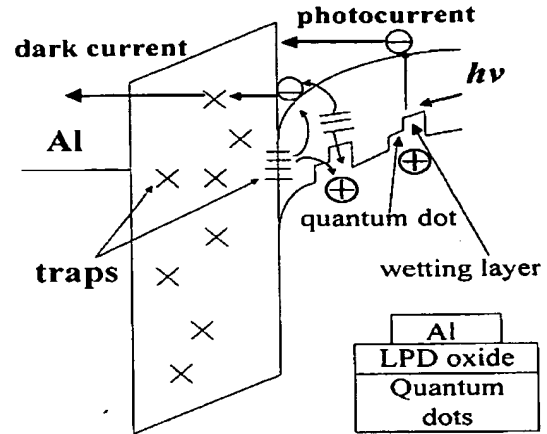

Fig. 8 The band diagram of a Ge quantum dot NMOS detector under inversion bias and the device structure. The photo-generated electrons tunnel through LPD oxide.
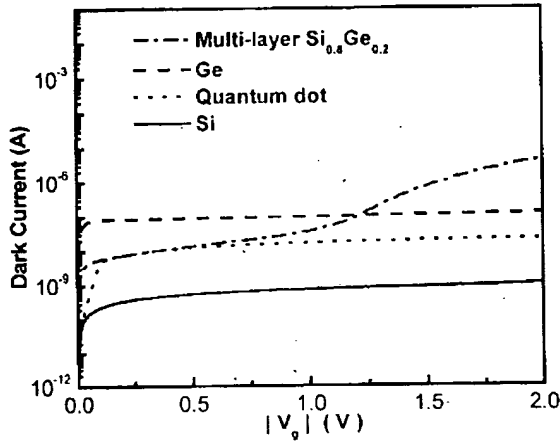
Fig. 9 The dark current of all 4 devices with LPD oxide.
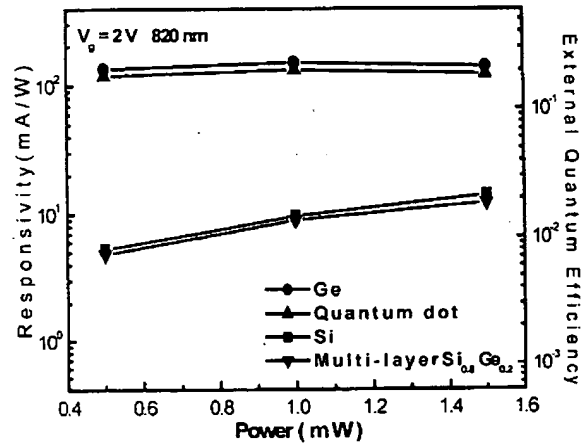
Fig. 10 The responsivity and efficiency at 820 nm. The Ge quantum dot device has a similar efficiency to Ge device.
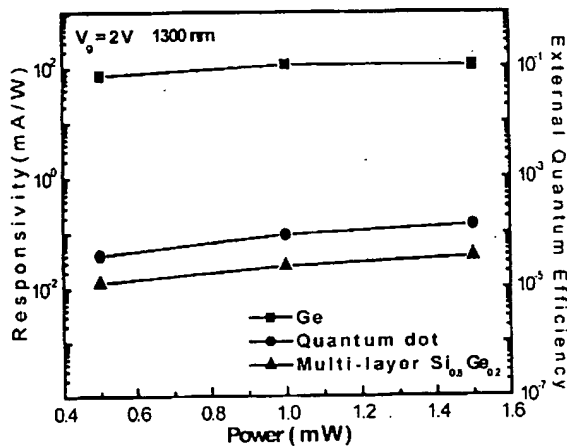
Fig.11 The responsivity and efficiency at 1300 nm. The efficiency of quantum dot detectors is larger than multi-layer $Si_{0.8}Ge_{0.2}$ detectors.
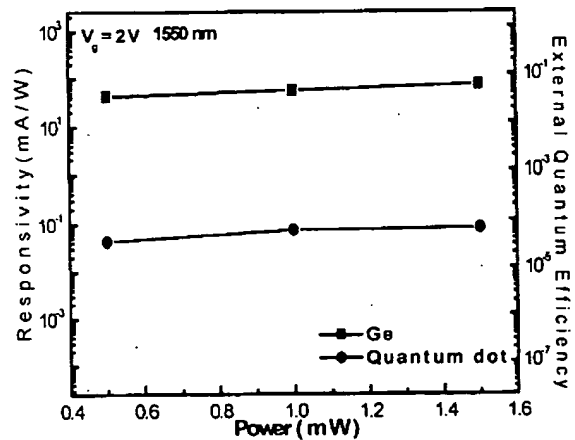
Fig.12 The responsivity and efficiency at 1550 nm. Only Ge and Ge quantum dot detectors have response at 1550 nm.

4.3.4

```
     L34   ANSWER 5 OF 19   HCAPLUS   COPYRIGHT   ACS on STN
AN     2004:802503   HCAPLUS
DN     141:323939
ED     Entered STN:   01 Oct 2004
TI     Method for forming a metal oxide film for capacitor
IN     Koyanagi, Kenichi; Sakuma, Hiroshi
PA     Japan
       PATENT NO.             KIND   DATE       APPLICATION NO.            DATE
       ---------------        ----   --------   --------------------       --------
PI     US 2004192036          A1     20040930   US 2004-808193             20040324
       JP 2004296814          A2     20041021   JP 2003-87577              20030327
       CN 1534741             A      20041006   CN 2004-10031392           20040326
       DE 102004016162        A1     20041111   DE 2004-102004016162       20040326
PRAI   JP 2003-87577          A      20030327
AB     A method for forming a capacitor insulation film includes the
       step of depositing a monoat. film made of a metal by supplying a metal
       source including the metal and no O, and depositing a metal oxide film
       including the metal by using a CVD technique.  The method
       provides the metal oxide film having higher film properties with a higher
       throughput.
IT     10028-15-6, Ozone, processes
       RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical,
       engineering or chemical process); PROC (Process); USES (Uses)
           (CVD forming metal oxide film for capacitor)
RN     10028-15-6  HCAPLUS
CN     Ozone (8CI, 9CI)  (CA INDEX NAME)



       O—O—O



IT     7440-21-3, Silicon, processes
       RL: PEP (Physical, engineering or chemical process); PYP (Physical
       process); TEM (Technical or engineered material use); PROC (Process); USES
       (Uses)
           (CVD forming metal oxide film for capacitor on)
RN     7440-21-3  HCAPLUS
CN     Silicon (7CI, 8CI, 9CI)   (CA INDEX NAME)



       Si
```

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  L34   ANSWER 1 OF 19   HCAPLUS   COPYRIGHT   ACS on STN
AN    2005:219585  HCAPLUS
DN    142:289437
ED    Entered STN:  11 Mar 2005
TI    Methods of forming metal thin films, lanthanum oxide films, and
      high dielectric films for semiconductor devices using atomic
      layer deposition
IN    Park, Ki-yeon; Kim, Sung-tae; Kim, Young-sun; Park, In-sung; Yeo,
      Jae-hyun; Lee, Yun-jung; Im, Ki-vin
      PATENT NO.            KIND   DATE      APPLICATION NO.         DATE
      ---------------       ----   --------  --------------------   --------
PI    US 2005051828         A1     20050310  US 2004-828596         20040421
PRAI  KR 2003-25533         A      20030422
AB    The present invention provides methods of forming metal thin
      films, La oxide films and high dielec. films.  Compns. of metal thin
      films, La oxide films and high dielec. films are also provided.  Further
      provided are semiconductor devices comprising the metal
      thin films, La oxide films and high dielec. films provided herein.
IT    10028-15-6, Ozone, processes
      RL: CPS (Chemical process); NUU (Other use, unclassified); PEP (Physical,
      engineering or chemical process); PROC (Process); USES (Uses)
         (forming metal thin films, lanthanum oxide films, and high dielec.
      films for semiconductor devices using at. layer deposition)
RN    10028-15-6  HCAPLUS
CN    Ozone (8CI, 9CI)  (CA INDEX NAME)


o_o_o
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   L53   ANSWER 8 OF 19   WPIX   COPYRIGHT   THE THOMSON CORP on STN
AN    1993-346486 [44]    WPIX
DNN   N1993-267615          DNC C1993-153382
TI    Semiconductor circuitry structure mfr., e.g. capacitor MOS transistor,
      pixel, etc. - comprises growing buffer layer of high dielectric constant
      oxide layer contg. no lead or bismuth, directly or indirectly on
      semiconductor substrate etc..
DC    L03 U11 U12 U14
IN    SUMMERFELT, S R
PA    (TEXI) TEXAS INSTR INC
CYC   7
PI    EP 568064       A2 19931103 (199344)* EN     9
         R: DE FR GB IT
      JP 06224184     A  19940812 (199437)        7
      TW 232748       A  19941021 (199501)
      US 5393352      A  19950228 (199514)        7
      EP 568064       A3 19940406 (199522)
      US 5650646      A  19970722 (199735)        7
      US 5912486      A  19990615 (199930)
      EP 568064       B1 19990714 (199932)   EN
         R: DE FR GB IT
      DE 69325614     E  19990819 (199939)
PRAI  US 1992-876930       19920501; US 1993-127222
      19930927; US 1995-395016        19950227; US
      1997-842863       19970417
AB    EP    568064 A UPAB: 19931213
```

Mfr. comprises (i) growing a buffer layer (26) of a non-Pb/Bi contg. high
dielectric constant oxide layer directly or indirectly on a
semiconductor substrate (10), and (ii) depositing a Pb/Bi-contg. high
dielectric constant oxide (28) on to the buffer layer.

The substrates are pref. Si or GaAs. A layer of Ge (12) (or a metal)
is pref. epitaxially grown directly or indirectly on the
semiconductor substrate and the buffer layer is grown on the Ge layer.
When the substrate is Si, the Ge layer is pref. less than 1 nm in
thickness and the buffer layer is less than 10 nm thick. A 2nd
non-Pb/Bi-contg. oxide layer (30) may be grown on top of layer (28), and a
conducting layer (32) may be grown on top of layer (30). Both high
dielectric constant oxides are pref. ferroelectric oxides and/or
titanates. The non Pb/Bi-contg. oxide is BaSrTiO3, the Pb/Bi-contg. oxide
is lead zirconate titanate, and both layers may be epitaxially grown. Both
oxides may be single crystals or the Ge layer may be grown on a non-single
crystal SiO2, Si3N4 or SiO2/Si3N4 layer which is directly or
indirectly grown on the semiconductor substrate.

USE/ADVANTAGE - Structures include capacitors, MOS transistors,
pixels for light detecting arrays and those for electro-optic
applications. The Ge buffer layer is effective and compatible with Si and
many oxides. It allows ferroelectrics to be directly grown on to
Si wafers to form non-volatile, non-destructive read out memory cells and
increases the capacitance of large dielectric constant oxide films.

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ABEQ US    5393352   UPAB: 19950412
```

The semiconductor structure is fabricated by (a) growing a Ge layer (in)
directly on a semiconductor substrate, (b) growing a perovskite
buffer layer of Pb and Bi free high dielectric constant oxide on.   .   .

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L58   ANSWER 3 OF 7   WPIX   COPYRIGHT   THE THOMSON CORP on STN
AN    1995-256972 [34]   WPIX
CR    1995-218447 [29]; 1995-256971 [34]; 2001-427784 [41]
DNN   N1995-198254        DNC C1995-117259
TI    Orienting thin film of ferroelectric material for electronic or light
      modulation device  - comprises perovskite conductive thin film formed on
      single crystal substrate, ferroelectric material formed on above thin
      film.
DC    L03 U11 U12 U14 V04 V07 X12
IN    NASHIMOTO, K
PA    (XERF) FUJI XEROX CO LTD
CYC   2
PI    JP 07133199      A   19950523  (199534)*       9
      US 5650362       A   19970722  (199735)       16
      US 5656382       A   19970812  (199738)       16<--
      JP 3199091       B2  20010813  (200148)        7
ADT   JP 07133199 A JP 1993-297621 19931104; US 5650362 A Div ex US 1994-325583
      19941019, US 1995-439371 19950511; US 5656382 A Cont of US 1994-325583
      19941019, US 1996-620752 19960318; JP 3199091 B2 JP 1993-297621 19931104
FDT   JP 3199091 B2 Previous Publ. JP 07133199
PRAI  JP 1993-297621          19931104; JP 1993-297620          19931104;
      JP 1993-297622          19931104
AB    JP  07133199 A UPAB: 20010829
```

An epitaxial or orienting perovskite ABO3 conductive thin film is formed
on a single crystal substrate. An epitaxial or orienting ABO3 thin film of
a ferroelectric substance is formed on the above thin film. The substrate
has an epitaxial or orienting buffer layer on its surface.

   USE - The orienting thin film of the ferroelectric material is used
for an electronic device, including a nonvolatile memory or a capacitor,
or a light modulation device.

   ADVANTAGE - Providing the epitaxial or orienting oxide electrode
between the ferroelectric substance and the substrate produces light
modulation device allowing low voltage driving, or a high performance
switching device, including a nonvolatile memory. The epitaxial or
orienting oxide electrode and the epitaxial or orienting thin film of the
ferroelectric material are formed on the semiconductor substrate. The
result produces the light modulation device on GaAs-based semiconductor
laser, or a light integrated circuit on an Si semiconductor integrated
circuit.

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ABEQ.   .  .  US   5650362UPAB: 19970828
```

A process for preparing a mono-axially oriented conductive thin film
comprising coating a single crystal **substrate** with a
metal oxide **precursor** solution comprising an
unhydrolyzed organometallic compound and subjecting the coating layer to
thermal decomposition followed by annealing the coated substrate. . .

```
ABEQ.   .  .
```

structure oxide conductive thin film of BaPbO3 oriented in only one
direction which is obtained by coating a single crystal **substrate**
with a solution of a **metal** oxide **precursor** comprising
an un-hydrolysed organometallic compound, thermally decomposing the
coating layer, and annealing the coated substrate.

```
    L34   ANSWER 17 OF 19  HCAPLUS   COPYRIGHT   ACS on STN
AN    2000:534917  HCAPLUS
DN    133:128678
ED    Entered STN:  04 Aug 2000
TI    Organometallic deposition of dielectric layers using supercritical fluids
      such as CO2 in semiconductor device fabrication
IN    Morita, Kiyoyuki; Ohtsuka, Takashi; Ueda, Michihito
PA    Matsushita Electric Industrial Co., Ltd., Japan
SO    Eur. Pat. Appl., 32 pp.
      CODEN: EPXXDW
      PATENT NO.            KIND   DATE        APPLICATION NO.          DATE
      ---------------       ----   --------    --------------------     --------
PI    EP 1024524            A2     20000802    EP 2000-101398           20000125
      CN 1264159            A      20000823    CN 2000-100676           20000127
      JP 2000357686         A2     20001226    JP 2000-18265            20000127
      TW 472295             B      20020111    TW 2000-89101390         20000127
      US 2002083959         A1     20020704    US 2000-492350           20000127
      US 6541278            B2     20030401
      US 2003003604         A1     20030102    US 2002-230249           20020829
      US 6713316            B2     20040330
      US 2003003770         A1     20030102    US 2002-230258     .     20020829
      US 6716663            B2     20040406
PRAI  JP 1999-18597         A      19990127
      JP 1999-104873        A      19990413
      US 2000-492350        A1     20000127
```

AB   A **semiconductor** substrate is placed within a housing. By
      supplying organometallic complexes and CO2 in a supercrit. state into the
      housing, a BST thin film is formed on a Pt thin film, while at the same
      time, C compds., which are produced when the BST thin film is formed, are
      removed. The soly. of C compds. in the supercrit. CO2 is very high, and
      yet the viscosity of the supercrit. CO2 is low. Accordingly, the C
      compds. are removable efficiently from the BST thin film. An oxide or
      nitride film may also be formed by performing oxidn. or nitriding at a low
      temp. using H2O in a supercrit. or subcrit. state, for example.
IT   7722-84-1, Hydrogen **peroxide**, uses 10028-15-6,
      Ozone, uses
      RL: NUU (Other use, unclassified); USES (Uses)
          (**oxidizing** agent; **organometallic** deposition of
          dielec. layers using supercrit. fluids such as carbon dioxide in
          semiconductor device fabrication)
RN   7722-84-1 HCAPLUS
CN   Hydrogen peroxide (H2O2) (9CI) (CA INDEX NAME)

HO—OH

RN   10028-15-6 HCAPLUS
CN   Ozone (8CI, 9CI) (CA INDEX NAME)

O—O—O

L36   ANSWER 5 OF 10 HCAPLUS   COPYRIGHT   ACS on STN
AN   2002:358781 HCAPLUS
DN   136:357461
ED   Entered STN: 14 May 2002
TI   Ozone-containing **aqueous oxidizing**
       solution and manufacture of lithium-containing **metal**
       oxide by using it for cathode active mass of secondary battery
IN   Maruta, Junichi
PA   Japan Storage Battery Co., Ltd., Japan
       CODEN: JKXXAF
       PATENT NO.   KIND   DATE   APPLICATION NO.   DATE
       ---------------   ----   --------   --------------------   --------
PI   JP 2002137923   A2   20020514   JP 2000-330737   20001030
PRAI JP 2000-330737   20001030
AB   The inversion relates to a **method** for manufg. Li-contg. metal
       oxide by low-temp. synthesis using O3 as oxidant under pH control of
       reaction soln. The **oxidizing soln.** contains alkali
       metal chloride and O3. The **method** for manufg. Li-contg.
       metal oxides involves a process for O3-**oxidn.** of
       transition **metal** hydroxides contg. Ni, Co, Mn, and/or Fe in a
       Li-ion-contg. soln. at pH 7.6-10.4. The **oxidizing soln**
       . is stably in basic pH range for a long period, and the Li-contg. metal
       oxide can be manufd. in high yield.
IT   Battery cathodes
          Oxidizing agents
           (**aq. oxidizing soln.** contg. alkali
           metal chloride and O3 for manuf. of Li-contg. metal oxide for
           battery cathode active mass)
IT   **10028-15-6, Ozone, uses**
       RL: NUU (Other use, unclassified); TEM (Technical or engineered material
       use); USES (Uses)
          (**aq. oxidizing soln.** contg. alkali
           metal chloride and O3 for manuf. of Li-contg. metal oxide for
           battery cathode active mass)
RN   10028-15-6 HCAPLUS
CN   Ozone (8CI, 9CI) (CA INDEX NAME)

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     L34   ANSWER 10 OF 19  HCAPLUS   COPYRIGHT   ACS on STN
AN     2002:522076  HCAPLUS
DN     137:81377
ED     Entered STN:  12 Jul 2002
TI     Method for depositing thin layers on a porous substrate, fuel
       cell and fuel cell comprising such a thin layer
IN     Cassir, Michel; Bernay, Cecile; Lincot, Daniel; Goubin, Fabrice
PA     Renault, Fr.
       PATENT NO.          KIND    DATE       APPLICATION NO.         DATE
       ---------------     ----    --------   --------------------    --------
PI     WO 2002053798       A1      20020711   WO 2001-FR4102          20011220
       FR 2818993          A1      20020705   FR 2000-17225           20001228
       FR 2818993          B1      20031128
       EP 1356133          A1      20031029   ·EP 2001-989640         20011220
PRAI   FR 2000-17225       A       20001228
       WO 2001-FR4102      W       20011220
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AB   The invention concerns a **method** for depositing on the surface of
       a porous substrate, thin layers of a solid ionic conductor comprising
       .gtoreq.1 base oxide and .gtoreq.1 doping agent. The deposition is
       carried out from precursor In of the metal ion of 1 of the base oxides,
       precursor II oxidizing the precursor In and,
       precursor IIIm of 1 of the oxides inputting 1 of the doping
       agents; n and m are each an integer .gtoreq.1. The **method**
       involves providing .gtoreq.1 base oxide in a 1st sequence and .gtoreq.1
       doping agent in a 2nd sequence. The 1st sequence is repeated 1-10 times,
       the 2nd sequence is repeated only once; the entire process constitutes a
       cycle. The deposition is produced for a (1st/2nd) sequence ratio detd. on
       the basis on the (doping agent(s)/basic oxide(s)) at. ratio and for a no.
       of cycles detd. on the basis of the thickness of the thin layer, and
       finally for a specific contacting duration between **precursors**
       and **substrate**. The invention also concerns a fuel cell, and a
       cell contg. such a thin layer.

IT   10028-15-6, Ozone, uses
       RL: TEM (Technical or engineered material use); USES (Uses)
           (precursor in deposition of thin layers on porous substrate in manuf.
           of fuel cells)

RN   10028-15-6 HCAPLUS
CN   Ozone (8CI, 9CI) (CA INDEX NAME)

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   L34   ANSWER 9 OF 19   HCAPLUS  .COPYRIGHT   ACS on STN
AN    2002:777943  HCAPLUS
DN    137:302573
ED    Entered STN:  11 Oct 2002
TI    Metalloamide and aminosilane precursors for CVD formation of dielectric
      thin films
IN    Baum, Thomas H.; Xu, Chongying; Hendrix, Bryan C.; Roeder, Jeffrey F.
PA    Advanced Technology Materials, Inc., USA
      PATENT NO.           KIND    DATE       APPLICATION NO.          DATE
      ---------------      ----    --------   --------------------     --------
PI    WO 2002079211        A1      20021010   WO 2002-US9390           20020327
      US 2002175393        A1      20021128   US 2001-823196           20010330
      US 2002187644        A1      20021212   US 2001-954831           20010918
      US 6869638           B2      20050322
      EP 1373278           A1      20040102   EP 2002-728580           20020327
      JP 2004529495        T2      20040924   JP 2002-577835           20020327
PRAI  US 2001-823196       A       20010330
      US 2001-954831       A       20010918
      WO 2002-US9390       W       20020327
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AB   A CVD method of forming gate dielec. thin films on a substrate
      is described which uses metalloamide compds. of the formula $M(NR1R2)p$, or
      [I where M is Zr, Hf, Y, La, lanthanide series elements, Ta, Ti, or Al; N
      is nitrogen; each of R1 and R2 is same or different and is independently
      selected from H, aryl, perfluoaryl, C1-C8 alkyl, C1-C8 perfluoroalkyl,
      alkylsilyl; and x is the oxidn. state on metal M;] and
      an aminosilane compd. of the formula $HpSiAq(NR1R2)4-p-q$, or [II where H is
      hydrogen; p is 0-3; Si is Si; A is a halogen; q is
      0-3; N is nitrogen; each of R1 and R2 is same or different and is
      independently selected from the group consisting of H, aryl,
      perfluoroaryl, C1-C8 alkyl, and C1-C8 perfluoroalkyl; and n is from 1-6.].
      By comparison with the std. SiO2 gate dielec. materials, these gate
      dielec. materials provide low levels of C and halide impurity.

IT   10028-15-6, Ozone, processes
      RL: CPS (Chemical process); PEP (Physical, engineering or chemical
      process); PROC (Process)
          (oxidizing gas; metalloamide and aminosilane
          precursors for CVD formation of dielec. thin films)

RN   10028-15-6 HCAPLUS
CN   Ozone (8CI, 9CI) (CA INDEX NAME)

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    L34   ANSWER 8 OF 19   HCAPLUS   COPYRIGHT   ACS on STN
AN     2002:975882   HCAPLUS
DN     138:48438
ED     Entered STN:   27 Dec 2002
TI     Atomic-layer deposition of metal oxide using organometallic complex having
       .beta.-diketone
IN     Lee, Jung Hyun; Kim, Dae Sik; Min, Joseph; Cho, Young Jin
PA     Samsung Electronics Co., Ltd., S. Korea
       PATENT NO.             KIND   DATE       APPLICATION NO.         DATE
       ---------------        ----   --------   --------------------    --------
PI     JP 2002371359          A2     20021226   JP 2002-79875           20020322
       KR 2002095342          A      20021226   KR 2001-33532           20010614
       US 2003008072          A1     20030109   US 2002-160111          20020604
       US 6752869             B2     20040622
PRAI   KR 2001-33532          A      20010614
AB     The title method involves letting the organometallic
       complex chemisorb on a substrate and oxidizing by
       activated O radicals.
IT     10028-15-6, Ozone, uses
       RL: NUU (Other use, unclassified); USES (Uses)
          (at.-layer deposition of metal oxide by radical oxidn
          . of chemisorbed organometallic complex having
          .beta.-diketone)
RN     10028-15-6  HCAPLUS
CN     Ozone (8CI, 9CI)  (CA INDEX NAME)
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